Plant Species Composition and Cover within Reestablished Buttonbush Communities

Expectation: Restoration of a buttonbush, *Cephalanthus occidentalis*, wetland shrub community on portions of the floodplain where the historic (prechannelization) buttonbush community has been drained, and cleared and converted to pasture or replaced by upland and mesophytic shrub communities. In these areas, reestablished canopy cover of buttonbush will exceed 25%; canopy cover of any other species will be < 5%. The reestablished buttonbush community will be dominated by obligate and facultative wetland species (Reed 1988), which will account for > 90% of the cover and > 75% of species composition.

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Relevant Endpoints:
Sociopolitical - Nuisance (Exotic) Species
Restoration - Biological Integrity - Community Structure
Restoration - Biological Integrity - Colonization Rates
Restoration - Biological Integrity - Population Abundance
Restoration - System Functional Integrity - Habitat Diversity

Baseline Condition: As a result of channelization, over 1000 ha (77%) of buttonbush community coverage within the historic floodplain (Pierce et al. 1982) were drained, and cleared and converted to cattle pasture or replaced by upland and mesophytic shrubs such as *Myrica cerifera, Baccharis halimifolia* and *Sambucus canadensis* (Milleson et al. 1980).

Baseline plant species composition and cover data were collected in July-October 1998 in 5 m x 20 m plots on portions of the channelized floodplain in Pools A and C where buttonbush communities had existed prior to channelization but are now covered by: 1) wet prairie and upland herbaceous communities and 2) a mesophytic shrub community. The wet prairie and upland herbaceous plots were established in pasture in the central portions of Pools A and C while mesophytic shrub plots were located in the more drained, northern portion of floodplain in each pool.

Axonopus fissifolius, a common forage grass species, *Panicum hemitomon*, a wetland grass, and *Baccharis halimifolia*, a mesophytic shrub, accounted for the highest plant cover in pasture sample plots in Pool A (n=3). *Axonopus fissifolius* also was common in the central Pool C pasture plots (n=6), but plant cover was largely dominated by wet prairie species such as *Centella asiatica, Diodea virginiana, Eleocharis vivipara, Juncus effusus, Luziola fluitans* and *Panicum hemitomon. Cephalanthus* was not found in any plots in Pool A, but occurred in three of the six sample plots in Pool C where it covered < 5% of each plot (Table 1). Obligate and facultative wetland species accounted for $\geq$ 90% of the plant cover in all plots in Pool C pasture except one (mean = 86 $\pm$ 6.8%), and 56 – 70% (mean = 63 $\pm$ 4.0%) of plant cover in Pool A plots. Obligate and facultative wetland species also accounted for > 75% of the species composition in five of six Pool C plots (mean = 78.5 $\pm$ 3.4%) and 59 –72% (mean = 63.4 $\pm$ 4.4%) in Pool A plots.

The mesophytic shrub plots had a canopy dominated by *Baccharis halimifolia* or *Diospyros virginiana*, and an understory consisting mainly of facultative and facultative upland species such as *Baccharis halimifolia, Diospyros virginiana,*

Rubus cuneifolius, Urena lobata, Panicum angustifolium, and Vitis rotundifolia, although one Pool A plot had significant cover of *Sacciolepis striata* (26-50%) and *Teucrium canadense* (6-25%), which are wetland species. *Cephalanthus* was found in the canopy of four plots and the understory of all plots in Pool C (n=6), but accounted for < 5% of the cover in both strata. *Cephalanthus* was found in the understory and canopy of only one of the plots in Pool A (n=3) where it also represented < 5% of the total plant cover. Obligate and facultative wetland species accounted for 12-47% (mean = 24 $\pm$ 5.3%) of the plant cover and 29-54% (mean = 36.2 $\pm$ 4.4%) of the species composition in Pool C shrub plots, and 16-75% (mean = 46 $\pm$ 17.1%) of the cover and 32-69% (mean = 55 $\pm$ 11.9%) of species composition in shrub plots in Pool A.

Reference Condition:

Based on photointerpretation of prechannelization aerial photography (Pierce et al. 1982), 1335 ha of the historic floodplain were covered by buttonbush communities, in which shrub cover, primarily *Cephalanthus*, was $\geq$ 30%. There are no quantitative data on plant species composition and cover within historic buttonbush communities of the Kissimmee River. Based on the distribution of these communities on the historic floodplain and associated inundation regimes (Toth et al., 1995), and characteristics of remaining floodplain wetlands with *Cephalanthus*, species composition of historic *Cephalanthus* communities likely consisted of broadleaf marsh associations and were dominated by obligate and facultative wetland species (Toth et al. 1998). Thus, reference conditions were derived from species composition (Toth 1991) and standing crop biomass (Toth, unpublished) data from transects in remnant broadleaf marshes in the impounded, lower portion of Pool B, where floodplain elevations have been exposed to long (typically $\geq$ 250 da) annual hydroperiods since channelization.

Plant species composition data were collected between 1984-1990 within 1 m^2 quadrats at 7.6 m intervals along three 275-400 m transects. Obligate and facultative wetland species accounted for $\geq$ 75% of the species composition in all sample quadrats (n = 351) and all species in 83-100% of quadrats per transect per year (Table 3). Only 8 of the 351 quadrat samples had facultative or facultative upland species, although 30 quadrats had 1-2 unidentifiable species. Reference data from these transects (see also Toth, 1991, Toth et al., 1995) indicate species composition of broadleaf marshes of the Kissimmee River floodplain is dominated by obligate and facultative wetland species, which typically include *Sagittaria lancifolia*, *Pontederia cordata*, *Panicum hemitomon, Leersia hexandra, Sacciolepis striata, Alternanthera philoxeroides*, *Nuphar lutea, Polygonum punctatum, Bacopa caroliniana, Hydrocotyle umbellata, Cephalanthus occidentalis* and *Ludwigia peruviana. Cephalanthus occidentalis* occurred in 25-65% of sample quadrats along the three transects (Table 3).

Standing crop biomass data were collected in 1990 from ten 0.5 m^2 quadrats along (equally spaced) two of these transects. All plant species along both transects were either obligate or facultative wetland species (Table 4). *Cephalanthus occidentalis* accounted for 20 - 24% of the total live standing crop along these transects but was more prevalent along DRS, where it accounted for 27-47% of the standing crop in four quadrats and 8-10% of the biomass in three others. Although these reference data are indicative of dominant species within broadleaf marsh communities, standing crop biomass is not directly comparable to cover data collected in baseline samples. Biomass of *Cephalanthus* in 0.5 m^2 quadrats, for example, was not indicative of its cover in the marsh.

Mechanism for Achieving Expectation:	As historical inundation characteristics, particularly prolonged (9-12 month) hydroperiods with fluctuating water levels are restored, buttonbush will reestablish primarily through colonization by remnant propagules or vegetative growth of adjacent plants. Obligate and facultative wetland species will colonize and expand through similar mechanisms, including the remnant seed bank. Reestablished hydroperiods will eliminate upland and mesophytic species. Reestablishment of buttonbush will be facilitated by discontinuance of brush clearing management measures (e.g., roller chopping) on portions of the floodplain that have been used as cattle pasture.
Adjustments for External Constraints:	None
Means of Evaluation:	Achievement of this expectation will be evaluated by post-restoration sampling of established baseline permanent plots in Pool C and simultaneous sampling of control plots in Pool A. Plant cover and species composition will be evaluated within these plots annually during August-September. Evaluation of this expectation will be based on reestablishment of all buttonbush shrub criteria (i.e., canopy cover of *Cephalanthus* > 25%, canopy cover of other species < 5%, proportional cover (> 90%) and composition (> 75%) of obligate and facultative wetland species) in each plot in Pool C. As during baseline sampling, cover of each plant species will be estimated using modified Daubenmire cover classes (Table 6), except for canopy cover of *Cephalanthus*, which will be estimated to the nearest 1%.
Time Course:	Based on responses to floodplain inundation experiments such as the demonstration project (Toth 1991) and the Rattlesnake Hammock impoundment in Pool A (Toth et al. 1998), buttonbush is expected to begin to colonize during the first year after fluctuating water level regimes are reestablished. However, because growth of this species is relatively slow, the expected coverage (> 25%) will likely take 3 –5 years to achieve. Dominant coverage and community composition by obligate and facultative wetland species will be reestablished within 3 years after hydroperiods are restored. The time period for this response will be delayed if dryer than normal climatic conditions lead to short (< 3 months) hydroperiods because facultative species are capable of persisting in areas subjected to short hydroperiods.

Table 1. Baseline plant species composition and cover in upland herbaceous (Pool A) and wet prairie (Pool C) plots (5 m x 20 m).

Plots	% *Cephalanthus*	% Cover of Obligate and Facultative Wetland Species	% of Obligate and Facultative Wetland Species
Pool A			
430	0	62	59
431	0	56	59
432	0	70	72
Pool C			
20	< 5	93	83
31	< 5	97	88
133	< 5	90	81
33	0	92	78
40	0	90	77
136	0	52	63

Table 2. Baseline plant species composition and cover in mesophytic shrub plots (5 m x 20 m) in Pools A and C.

Plots	% *Cephalanthus* Understory	Canopy	% Cover of Obligate and Facultative Wetland Species	% of Obligate and Facultative Wetland Species
Pool A				
443	0	0	16	32
444	0	0	75	69
445	< 5	< 5	46	65
Pool C				
08	< 5	< 5	15	29
09	< 5	< 5	12	35
13	< 5	0	21	30
14	< 5	< 5	20	25
15	< 5	0	47	43
116	< 5	< 5	32	54

Table 3. Reference conditions for relative proportion of obligate and facultative wetland species in broadleaf marsh. Data were collected within 1 m^2 quadrats along remnant broadleaf marsh transects (DRN, DRS and TT) in the lower portion of Pool B.

Transect	Year	N	% of Quadrats with *Cephalanthus*	% of Quadrats with only Obligate and Facultative Wetland Species	Lowest Proportion (% per quadrat) of Obligate and Facultative Wetland Species
DRN	1984	37	65	87	83
DRS	1984	37	54	84	78
DRS	1990	37	49	92	83
TT	1984	48	25	83	80
TT	1986	48	29	88	75
TT	1987	48	33	92	75
TT	1988	48	32	100	100
TT	1990	48	29	92	80

Table 4. Reference conditions for relative cover of plant species within broadleaf marshes. Relative (% of total biomass) standing crop of plant species found within ten 0.5 m^2 samples along remnant broadleaf marsh transects (DRS and TT) in lower Pool B.

Plant Species	DRS	TT
Alternanthera philoxeroides	0.1	1.6
Bacopa carolininana	1.3	0.0
Cephalanthus occidentalis	20.4	24.3
Eleocharis interstincta	0.4	0.3
Ipomoea sagittata	< 0.1	0.0
Leersia hexandra	2.5	< 0.1
Ludwigia peruviana	< 0.1	4.3
Luziola fluitans	< 0.1	0.0
Nuphar lutea	0.0	0.2
Panicum hemitomon	20.0	25.2
Polygonum punctatum	2.4	12.5
Pontederia cordata	8.7	0.3
Rhynchospora inundata	0.4	0.0
Sacciolepis striata	13.5	0.2
Sagittaria lancifolia	29.7	25.3
Salvinia minima	0.5	0.0
Sarcostemma clausum	0.1	4.8
Scirpus californicus	0.0	1.2

Table 6. Modified Daubenmire scale used for differentiating cover classes of plant species within plots.

Understory		Canopy	
Cover Class	% Cover	Cover Class	% Cover
1	1 – 5	1	1 - 5
2	6 – 25	2	6 - 50
3	26 – 50	3	51 - 90
4	51 – 75	4	> 90
5	76 – 95		
6	> 95		

References

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